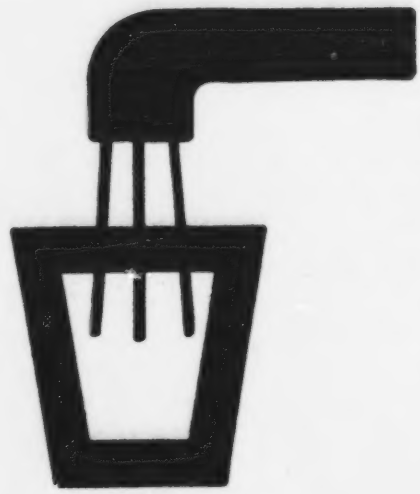
REGIONAL PLANNING AND DEVELOPMENT SERIES

WATER DEMAND AND SUPPLY
1976-2001



THE REGIONAL MUNICIPALITY OF WATERLOO

DEPARTMENT of PLANNING and DEVELOPMENT

Publication Number Four September 1978

WATER DEMAND AND SUPPLY 1976 - 2001

PUBLICATION NO. 4

This publication is number four in a series of publications on Region-wide issues for discussion and eventual decisions concerning the continued supply of water. This particular publication was mainly researched and analysed by Mark Dorfman in conjunction with the Commissioner and in consultation with Messrs. D'Arcy Dutton, Commissioner of Engineering and John Pawley.

The implication sections of this publication are solely those of the Regional Department of Planning and Development.

Bill Thomson, M.A., M.C.I.P.
Commissioner
Department of Planning and Development
Regional Municipality of Waterloo

October 1978

WATER DEMAND AND SUPPLY 1976 - 2001

PURPOSE OF PUBLICATION

This is an analysis of the future water supply and how it will be used by people and industry in Kitchener, Cambridge and Waterloo. We have known for many years that, because this is an inland urban community, there is a limit on our groundwater supply. We do not have the plentiful source provided by any of the Great Lakes. Our objectives are to conserve our future water supply and make it last for many more years and to secure the future water supply to satisfy our future demand.

The Region of Waterloo is required by statute to find water and to provide this water to the Area Municipalities. In this Region, our main problem is providing water to the three Cities. The only source of water, at this time, is the ground where water is obtained from aquifers by wells in Wilmot and Cambridge. In the future, the Region of Waterloo must use surface water from the Grand River at certain times of the year to augment the existing groundwater supply used in Kitchener and Waterloo and possibly Cambridge.

This publication looks at the demand for water based on the predictions of population and development to 2001 prepared by the Department of Planning and Development in previous publications in this series.

INFORMATION BASIC TO THIS PUBLICATION

1. Water Supply

The Regional Engineering Department has provided an estimate of the likely sources of water for the future. The list will be complete when exploration in the Cambridge area is completed and the experimentation with artificial recharge of the Mannheim aquifer is satisfactory.

The amount of water to be supplied is based on the need to provide water for the maximum day demand. This is the day during the year when the most water is taken from the system. This maximum day occurs during the summertime when lawn watering takes place. Water demand changes every day of the year depending upon industrial needs and of course whether there is a rainy or dry season.

(a) For Kitchener-Waterloo

Existing supply from groundwater supply:

33 million gallons per day

Future known supply:

Forwell river aquifer : 2.5 m.g.d.
Woolner river aquifer : 6.0 m.g.d.
Breslau river aquifer : 1.0 m.g.d.

Additional periodic groundwater from twinning Mannheim wells used at certain times of year.

The total future supply is 42.5 m.g.d. for the maximum day.

The use of the river-connected wells and the use of the twinned wells is expected to add 9.5 m.g.d. to the total water supply perennially. This process is called induced infiltration of the aquifer beside the Grand River. Water during the "wet" season (fall, winter and spring) is induced from the river into the adjacent watertable then pumped into the Kitchener-Waterloo system. The twinning of the Mannheim wells provides the total amount of water for Kitchener-Waterloo during the summer.

Regional Council has accepted the principle of progressively twinning the existing Mannheim wells. As well, Regional Council has agreed to start bringing water from the Forwell river-connected well in 1979. This is expected to produce 2 m.g.d. for the maximum day. Regional Council has also agreed to proceed with the acquisition of lands needed to test the feasibility of the artificial recharge of the Mannheim aquifer. This is a long term project which will likely come on-stream in the late 1980's or early 1990's.

Artificial recharge of the Mannheim aquifer requires that surface water be taken from the Grand River and pumped into the aquifer through a pit to be located on the west side of the City of Kitchener. (This is the land now being expropriated). This process permits the continued use of this aquifer without over-production. The entire water taking from the Grand River infiltration and artificial recharge is estimated to be 115 c.f.s. (cubic feet per second) in 1990. This has the impact of reducing the equivalent flow in the Grand River available for assimilating effluent from the sewage treatment plants. The reduction in flow reduces the dissolved oxygen levels in the river needed to satisfy the oxygen demanding materials in the river. The Ontario Ministry of the Environment has specific minimum water quality levels which must be maintained.

(b) For Cambridge

Existing supply from	Cambridge wells:		17 m.g.d.
Future known supply	Shades Mill #2	:	1 m.g.d.
	Willard	:	2 m.g.d.
	Hespeler	:	1 m.g.d.

The total future supply from the Cambridge wells is 21 m.g.d. for the maximum day.

There is no Regional Council commitment to proceed with the opening of the three new wells.

Regional Council has commissioned a study to find additional water sources in the vicinity of Cambridge and in Puslinch Township, North Dumfries Township and South Dumfries Township. This study will be completed in 1980.

2. Emergency Reserve

In Kitchener-Waterloo and in Cambridge, the Regional Engineering Department estimates an emergency reserve of 3 million gallons for the maximum day in each area. This is based on the event that a primary well is shut-down and there is a disproportionately high demand due to a major fire or watermain break. This 3 m.g.d. is a necessary precaution and must not be part of the estimated supply in each of the two systems.

3. Maximum Day Demand

The estimate of the future or trend in the water consumed is based on the experience of the past five years. In the five year period, there is a cycle of use depending upon the amount of rain. Lawn watering during dry seasons pushes the maximum day demand upward. For example, 1977 was a wet year and 1978 is a dry year.

(a) Kitchener-Waterloo

Trend Projection

average day per capita : 100 gallons
maximum day per capita : 160 gallons
peaking factor (160:100) : 1.6

Experience

	Average Day	Maximum Day	Peaking Factor
1973	105 gal.	168 gal.	1.60
1974	105 gal.	168 gal.	1.60
1975	96 gal.	148 gal.	1.54
1976	95 gal.	148 gal.	1.56
1977	97 gal.	135 gal.	1.39
1978*	103 gal.	162 gal.	1.57

* 1st seven months

(b) Cambridge

Trend Projection

average day per capita : 120 gallons
maximum day per capita : 180 gallons
peaking factor (180:120) : 1.5

Experience

	Average Day	Maximum Day	Peaking Factor
1973	128 gal.	188 gal.	1.47
1974	135 gal.	200 gal.	1.48
1975	122 gal.	182 gal.	1.49
1976	122 gal.	187 gal.	1.53
1977	114 gal.	154 gal.	1.35
1978*	117 gal.	177 gal.	1.51

* 1st seven months

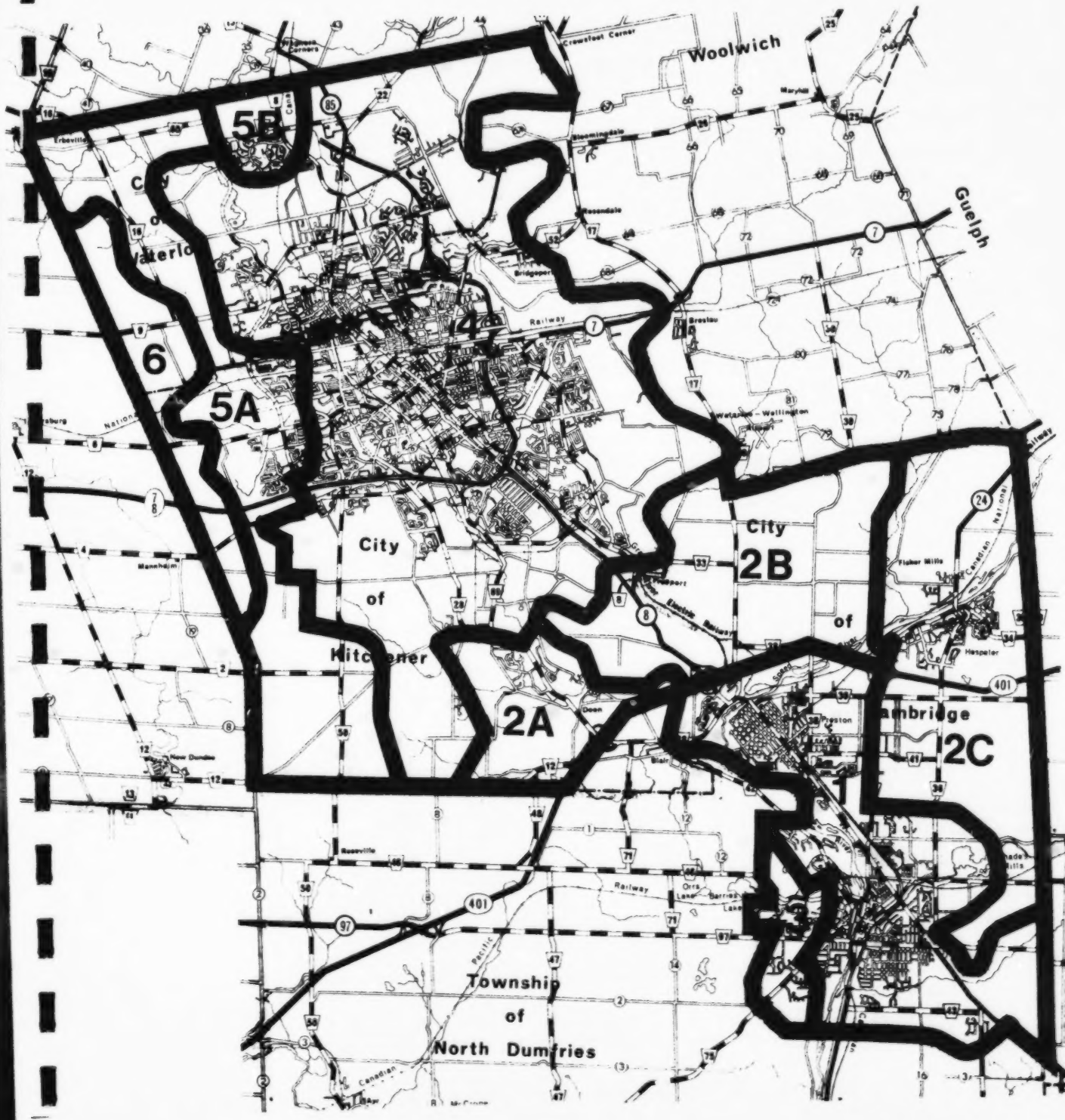
4. Water Distribution Zones

The Tri-City Water Study (Regional Municipality of Waterloo, 1975) sets out six water pressure or distribution zones in the three cities. These zones are defined by the highest altitude above sea level and the pressures created in the watermains necessary for distribution and fire-fighting purposes.

Figure 1, illustrates these zones. For the purposes of future water supply estimates, Kitchener and Waterloo are treated as one water supply system and it is anticipated by the Regional Engineering Department that water from both the well and river sources will together supply the needs of both cities. Cambridge is a separate system and at this time there is no anticipation of an interconnection with Kitchener-Waterloo.

Figure 1

WATER SUPPLY ZONES
KITCHENER-WATERLOO AND CAMBRIDGE



5. Population Forecast*

TABLE 1

POPULATION FORECASTS BY AREA MUNICIPALITY

(REVISED, AUGUST, 1978)

	1976	1981	1986	1991	1996	2001
KITCHENER	131932	147054	165529	185021	202311	219785
CAMBRIDGE	72070	84788	95440	107580	121572	134625
WATERLOO	49112	58954	69716	79116	88627	98929
WOOLWICH	15869	17042	17900	19785	22756	24532
WILMOT	10449	11094	11449	12346	12843	14485
WELLESLEY	6333	6724	6960	7413	7784	8280
NORTH DUMFRIES	4847	5511	5819	7339	8122	9306
REGIONAL MUNICIPALITY	290602	331203	372813	418600	464015	509942

PERCENT CHANGE IN POPULATION PER ANNUM

	1976 - 1981	1991 - 1896	1986 - 1991	1991 - 1996	1996 - 2001
KITCHENER	2.3	2.5	2.3	1.9	1.7
CAMBRIDGE	3.5	2.5	2.5	2.6	2.1
WATERLOO	4.0	3.6	2.7	2.4	2.3
WOOLWICH	1.5	1.0	2.1	3.0	1.8
WILMOT	1.8	0.6	1.6	0.8	2.6
WELLESLEY	1.2	0.7	1.3	1.0	1.3
NORTH DUMFRIES	2.7	1.1	5.2	2.1	2.9
REGIONAL MUNICIPALITY	2.8	2.5	2.5	2.2	2.0

* From Regional Planning and Development Series. Publication No. 1 Population 1976 - 2001, September, 1978

POPULATION PROJECTIONS BY MUNICIPALITIES

1976 - 2001

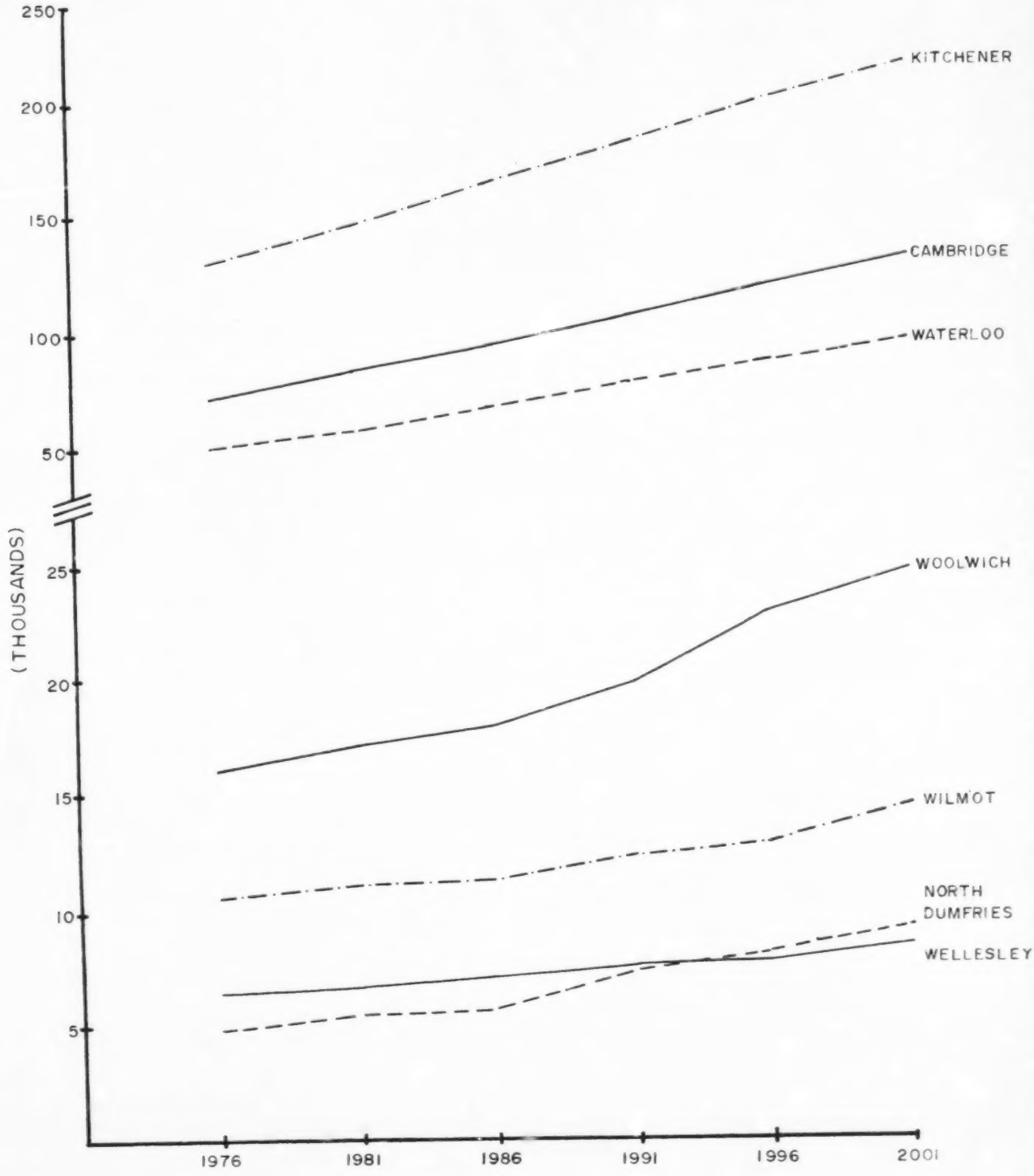


FIGURE 2

KITCHENER-WATERLOO

(a) Future Supply and Demand

The existing and future population shown in Table 1 is divided into the five zones serving Kitchener-Waterloo (Table 2). The population is based on the known development proposals at the time and on advice from staff of the Cities of Kitchener and Waterloo.

This population is used to derive the maximum day demand using the assumed trend in demand derived above.

The trend is straight-line and represents the average of the past. We know that with conservation of water, and other water restrictions, the maximum day demand will be less in the future.

The total maximum day demand is projected to increase from 26.5 m.g.d. in 1976 to 51.0 m.g.d. in 2001. This is a 93% increase in maximum day demand.

TABLE 2

POPULATION BY WATER DISTRIBUTION ZONES *

KITCHENER-WATERLOO

Zone	1976	1981	1986	1991	1996	2001
2A	0	5566	10985	14076	17146	20281
4	161023	173536	184218	200885	215531	230856
5A	11097	18265	29397	36266	43097	50097
5B	6576	8641	10645	11534	12432	13391
6	0	0	0	1376	2732	4088
Total	178696	206008	235245	264137	290938	318714

MAXIMUM DAY DEMAND (M.G.D.)

KITCHENER-WATERLOO

Zone	1976	1981	1986	1991	1996	2001
2A	0	0.9	1.7	2.3	2.8	3.3
4	23.8	27.8	29.5	32.1	34.5	36.9
5A	1.7	2.9	4.7	5.8	6.9	8.0
5B	1.0	1.4	1.7	1.9	2.0	2.1
6	0	0	0	0.2	0.4	0.7
Total	26.5	33.0	37.6	42.3	46.6	51.0

Assumptions *						
average gallons per capita day	95	100	100	100	100	100
peaking factor	1.56	1.6	1.6	1.6	1.6	1.6
maximum day demand	148	160	160	160	160	160

* This is the trend projection by the Regional Engineering Department based on previous experience.

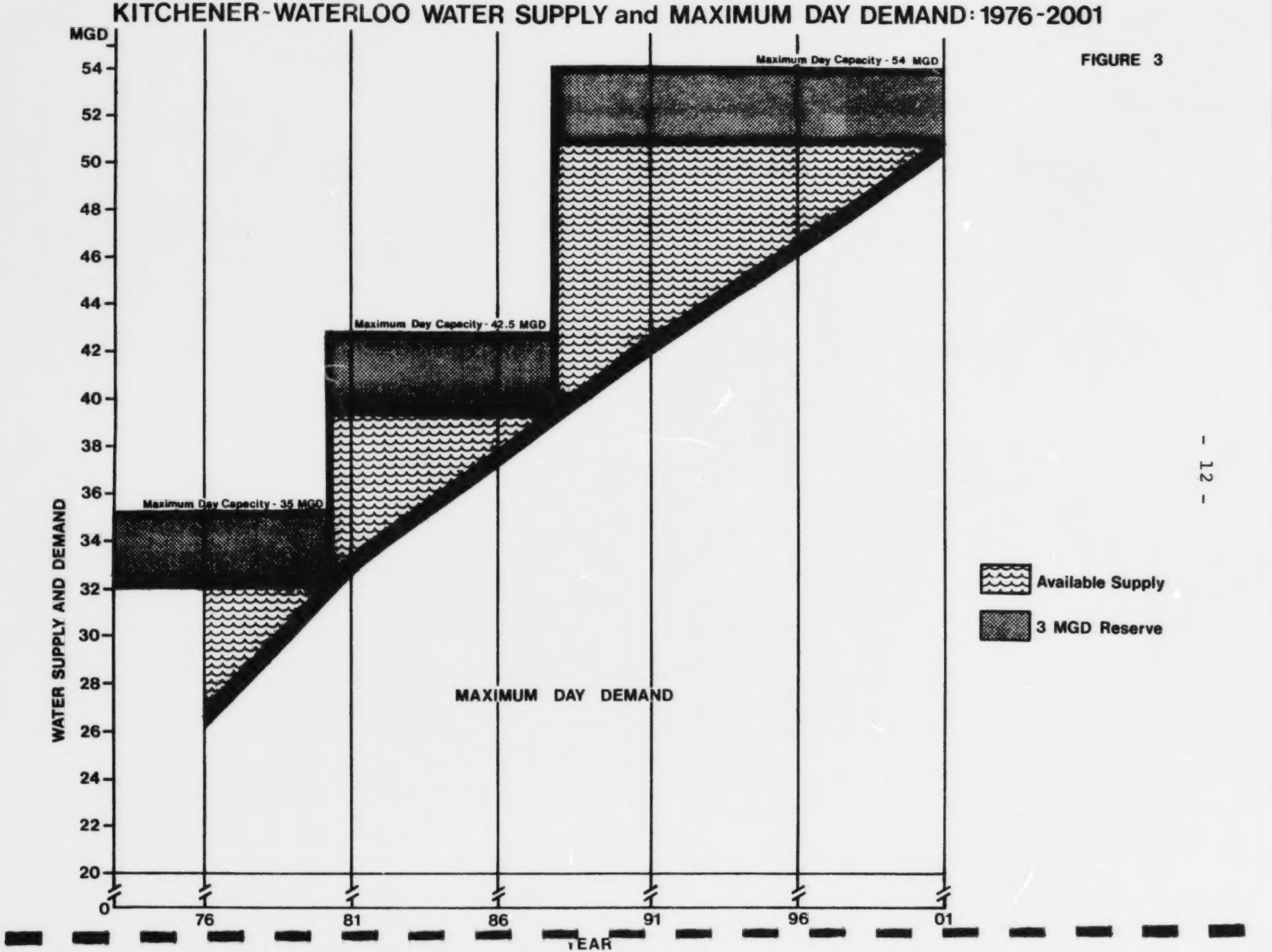

KITCHENER-WATERLOO WATER SUPPLY and MAXIMUM DAY DEMAND: 1976-2001
MGD
54
52
50
48
46
44
42
40
38
36
34
32
30
28
26
24
22
20
0
WATER SUPPLY AND DEMAND
Maximum Day Capacity - 54 MGD
Maximum Day Capacity - 42.5 MGD
Maximum Day Capacity - 35 MGD
MAXIMUM DAY DEMAND
Available Supply
3 MGD Reserve
76
81
86
91
96
01
YEAR

FIGURE 3

(i) With existing water supply of 33 m.g.d. and 2 m.g.d. from the Forwell well, maximum day demand cannot be met after 1980.

(ii) An addition of 7.5 m.g.d. from the remaining river-connected wells and corresponding twinning of the Mannheim wells, will increase supply to 42.5 m.g.d. This will satisfy the maximum day demand up to 1988.

(iii) After 1988, maximum day demand must be met from artificial recharge of the Mannheim Aquifer or if this system is not fully operational, water must be taken from the Grand River during the summer "wet" season and pumped directly into the Kitchener-Waterloo system. This latter proposal requires approval of the Ontario Ministry of the Environment. This may not be possible due to the seasonal low flows in the Grand River and the corresponding decrease in river water quality.

(b) Reduction in Maximum Day Demand in Kitchener-Waterloo

With a dedicated political effort through the combination of tough water conservation by-laws for lawn watering and increased wholesale and retail water rates, based on the more water used the greater the cost per unit, the total peak day supply requirements can be stretched out for additional years.

Assuming a 3% reduction in total maximum day demand in each five-year period after 1976, Figure 4 and Table 4 show the comparison between the demands based on trend and the reduction.

In the early years, very little is gained but by the year 2001, the total maximum day demand is reduced by 7.3 m.g.d. or by 14% in total.

The increase in water supply from the river wells and the Mannheim twinning is still needed in 1979.

This postpones the need for using artificial recharge in the Mannheim pit for five years to 1993. This allows the Region of Waterloo, the Grand River Conservation Authority and the Provincial Government to evaluate the methods of up-stream storage from all viewpoints. There is sufficient time before making this very important decision which has serious social, economic and environmental implications.

TABLE 4

REDUCTION IN TOTAL MAXIMUM DEMAND (M.G.D.)

IN EACH FIVE YEAR PERIOD

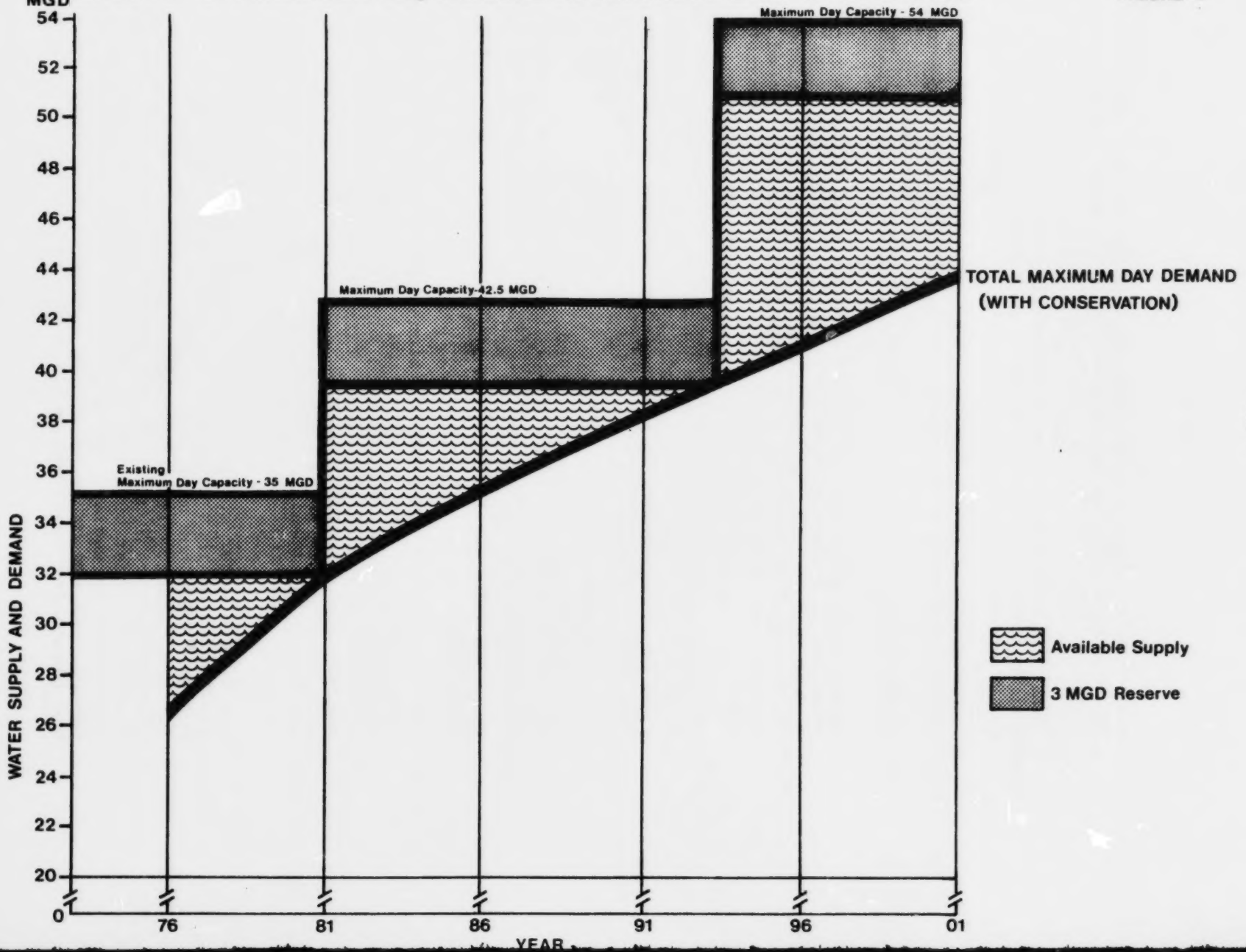
KITCHENER-WATERLOO

	1976	1981	1986	1991	1996	2001
Total	26.5	31.9	35.3	38.3	41.0	43.7
Average gallons per capita	95	100	98	95	92	89
peaking factor	1.56	1.55	1.53	1.53	1.53	1.54
maximum day demand	148	155	150	145	141	137

KITCHENER-WATERLOO WATER SUPPLY and MAXIMUM DAY DEMAND: 1976-2001

Effect of 3% Maximum Day Demand Reduction in Each 5-Year Period

FIGURE 4



The conservation of water and the reduction in peak demand must continue every year if these benefits are to be realized.

This tough alternative will allow the community to grow and develop as predicted without intervening in the decision when to allow development. This approach of "using less to obtain more" is a positive approach to water management planning and, if used perennially does not force the Regional Municipality into crisis-management.

(c) Implications in Kitchener-Waterloo during the next 10 years

There is a potential to build 7600 dwelling units (other than the apartment blocks in Kitchener) which are either on registered plans or committed in draft approval plans in Kitchener-Waterloo. These dwelling units are needed to meet the estimated new housing demand to approximately 1982.

In terms of population, these units can accommodate 22,800 people in the two cities. Additional population will also be accommodated in the existing housing stock during the same period.

If the Kitchener-Waterloo water supply is not increased to 42.5 m.g.d. by 1980, then there will be a crisis to satisfy the consumption from people in already committed housing. As well, it is expected that the volume of industrial and commercial consumption will continue to increase and its demands will also be affected.

The question is how much additional new housing development should be committed at this time. There are already applications to subdivide land for another 8,200 dwelling units in Kitchener-Waterloo. This is enough housing to satisfy the expected growth to approximately 1992 notwithstanding the additional potential for redevelopment and infilling in both cities which is enough to take us to 2001.

The future water supply for the next 10 years is not guaranteed at this time and there is therefore a great concern about how much new housing should be committed for the future. It is unreasonable to allow all new housing applications to go ahead knowing full well of the possibility that cutbacks in water consumption could be legislated by Regional Council to meet this growing water demand. On the other hand, the community must plan for the future for other reasons.

We are undoubtedly heading into a short-term crisis management as far as water supply is concerned. This is really not the approach to take but now that the Regional Municipality is securing a water supply from within the area, we must hold back on development commitments until we are certain that maximum day demand can be met.

In the 1978-1982 Capital Expenditure Forecast for the Regional Municipality, some of the required water supply items appear, as follows:

1978	Forwell Induced Infiltration
1979	Forwell Induced Infiltration
1980	Ebycrest Induced Infiltration
	Mannheim Peaking Wells
1981	Ebycrest Induced Infiltration
	Woolner Induced Infiltration
	Mannheim Peaking Wells
1982	Woolner Induced Infiltration
	Mannheim Peaking Wells

Regional Council approved this forecast with only the 1978 expenditure being actually committed in the Capital Budget. There is no budget or commitment for any item other than starting the Forwell Induced Infiltration.

The only commitment that the future water supply will be brought on-stream when needed is through the approval by Regional Council of each item in its Capital Budget. Therefore, the rest of the induced infiltration wells and the Mannheim peaking wells cannot be counted as committed until Regional Council approves the individual budget items.

On the development side, Regional Council should continue to impose a condition on subdivision plan approval that limits the registration of the plan to the time when maximum day water supply throughout Kitchener-Waterloo is assured. This could mean that there will be some ranking of subdivisions in order that they can be fairly released.

If it is possible, some developers may choose to freeze some of their existing housing commitments in Kitchener-Waterloo and use an equal amount as credits towards new registrations. This would involve entering into an agreement with the Regional Municipality. It may be possible, in isolated instances, to transfer water between pressure zones.

Next year, Regional Council should review the future water supply estimates and the estimated demand and announce the subdivision commitments which it will consider in that year allowing for a continuing over-supply of lots. The same requirement should apply to redevelopment proposals requiring development permission through rezoning or subdivision. This monitoring must be continued because of the sensitive demand-supply balance expected in the next 10 years. All community plans must contain this Regional policy on water supply. Regional Council makes the final decision on Regional supply of water.

The following communities and areas are known to be affected by this approach:

Lakeshore North	Waterloo
Beechwood West	Waterloo
Westvale	Waterloo
Lincoln East	Waterloo
Lincoln North & Dominion Life	Waterloo
Highland West	Kitchener
Forest Heights West	Kitchener
Country Hills West	Kitchener
East of Country Hills	Kitchener
Pioneer Park West	Kitchener
Doon South	Kitchener
Lower Doon	Kitchener
Hidden Valley	Kitchener
Grand River South	Kitchener
Grand River North	Kitchener
Block Plan 61	Kitchener

CAMBRIDGE

(a) Future Supply and Demand

The existing and future population shown in Table 1 is divided into four zones serving Cambridge (Table 5). The population is based on the known development proposals at the time and on advice from staff of the City of Cambridge.

This population is used to derive the maximum day demand using the assumed trend in demand as derived above.

The trend is straight-line and represents the average of the past. We know that with conservation of water, and other water restrictions, the maximum day demand will be less in the future.

The total maximum day demand is projected to increase from 13.2 m.g.d. in 1976 to 24.1 m.g.d. in 2001. This is an 83% increase in maximum day demand.

These amounts are estimates which must be met by the Cambridge water supply system in each of the five year periods.

Figure 5 illustrates the relationship between the projected maximum day demand and the known water supply sources, taking into account the 3 m.g.d. emergency reserve.

(i) With existing water supply of 17 m.g.d, the total maximum day demand cannot be met after 1981 and still retain the 3 m.g.d. reserve. This reserve is already being used.

(ii) An addition of 4 m.g.d., from the Shades Mill #2, Willard and Hespeler wells, will increase supply to 21 m.g.d. This will satisfy the maximum day demand up to 1988.

(iii) In order to meet maximum day demand after 1988, an additional 7 m.g.d. must be added to bring supply to 28 m.g.d. This will satisfy the maximum day demand to 2001. This source of water are wells outside the City or even outside the Regional Municipality.

TABLE 5

POPULATION BY WATER DISTRIBUTION ZONES

CAMBRIDGE

Zone	1976	1981	1986	1991	1996	2001
1	50208	52899	55479	61883	66103	69243
2B	0	0	0	0	3953	7724
2C	11973	18713	23576	27738	31891	36187
3	8338	11646	14859	16625	18395	20251
Total	70519	83258	93914	106246	120342	133405

MAXIMUM DAY DEMAND (M.G.D.)*

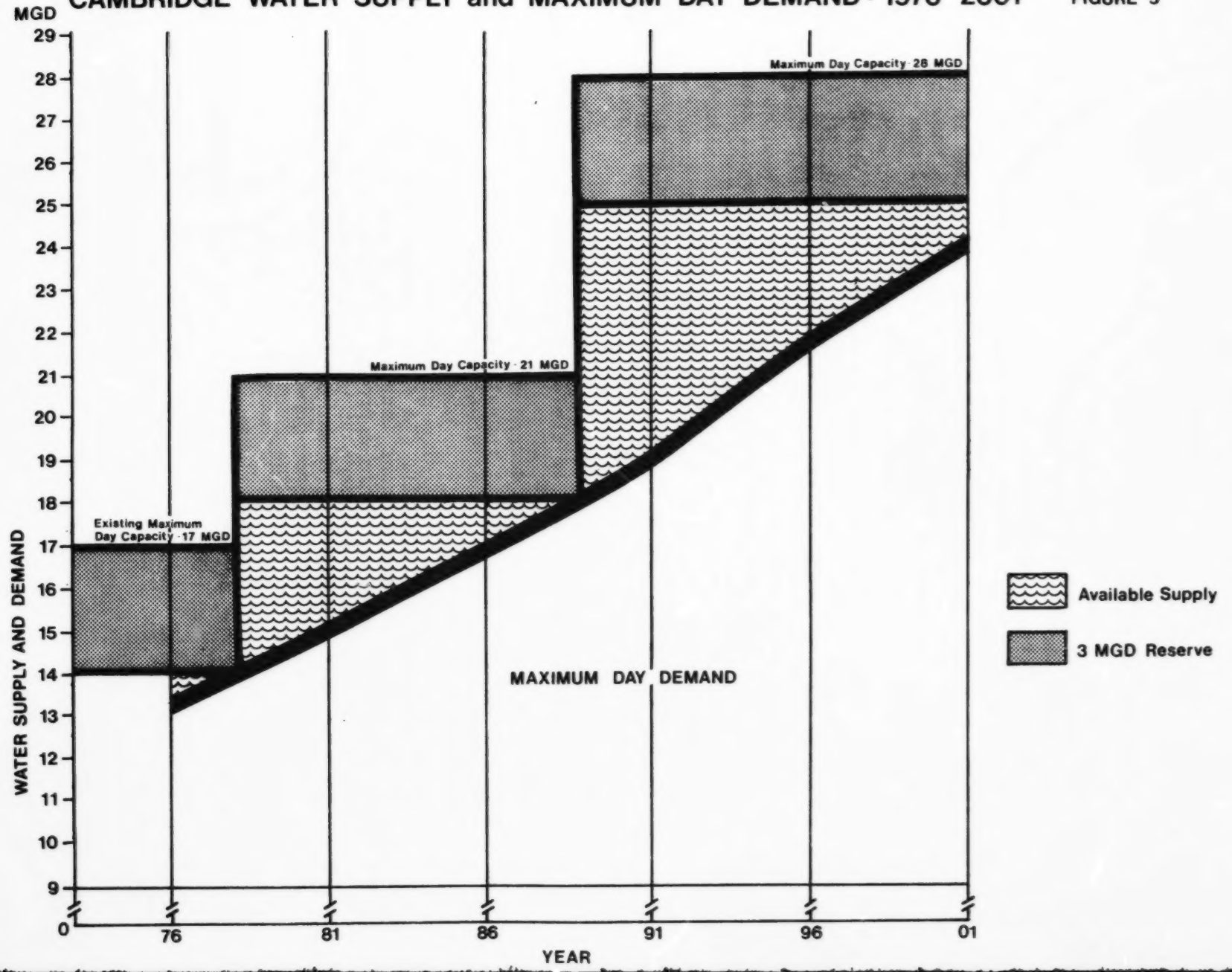
CAMBRIDGE

Zone	1976	1981	1986	1991	1996	2001
1	9.4	9.5	10.0	11.1	11.9	12.5
2B	0	0	0	0	0.7	1.4
2C	2.2	3.4	4.2	5.0	5.8	6.5
3	1.6	2.1	2.7	3.0	3.3	3.7
Total	13.2	15.0	16.9	19.1	21.7	24.1
Assumptions*						
average gallons per capita per day	122	120	120	120	120	120
peaking factor	1.53	1.5	1.5	1.5	1.5	1.5
maximum day demand	187	180	180	180	180	180

* This is the trend projection by the Regional Engineering Department based on previous experience.

CAMBRIDGE WATER SUPPLY and MAXIMUM DAY DEMAND: 1976 - 2001

FIGURE 5



(b) Reduction in Maximum Day Demand

With a dedicated political effort through the combination of tough water conservation by-laws for lawn watering and increased wholesale and retail water rates, based on the more water used the greater the cost, the total peak day supply requirement can be stretched out for additional years.

Assuming a 3% reduction in total maximum day demand in each five-year period after 1976, Figure 6 and Table 6 show the comparison between the demands based on trend and the reduction.

In the early years, very little is gained but by the year 2001, the total peak day demand is reduced by 3.4 m.g.d. or 14% in total.

The three wells must still be added into the system and there must still be a concerted program to find additional sources of water for Cambridge.

The conservation program and a reduction in peak demand will have the significant effect of postponing new wells outside Cambridge or the Region from 1988 to 1993, keeping the constant 3 m.g.d. reserve.

The conservation of water and the reduction in peak demand must continue every year if these benefits are to be realized.

The 3% reduction in peak demand must be made with the full knowledge that the textile industries in Cambridge must not be jeopardized before other economic factors cause changes in this industry.

This tough alternative will allow the community to grow and develop as predicted without intervening in the decision when to allow development. This approach of "using less to obtain more" is a positive approach to water management planning and, if used perennially, does not force the Regional Municipality into crisis-management.

TABLE 6

REDUCTION IN TOTAL MAXIMUM DAY DEMAND (M.G.D.)

IN EACH FIVE YEAR PERIOD

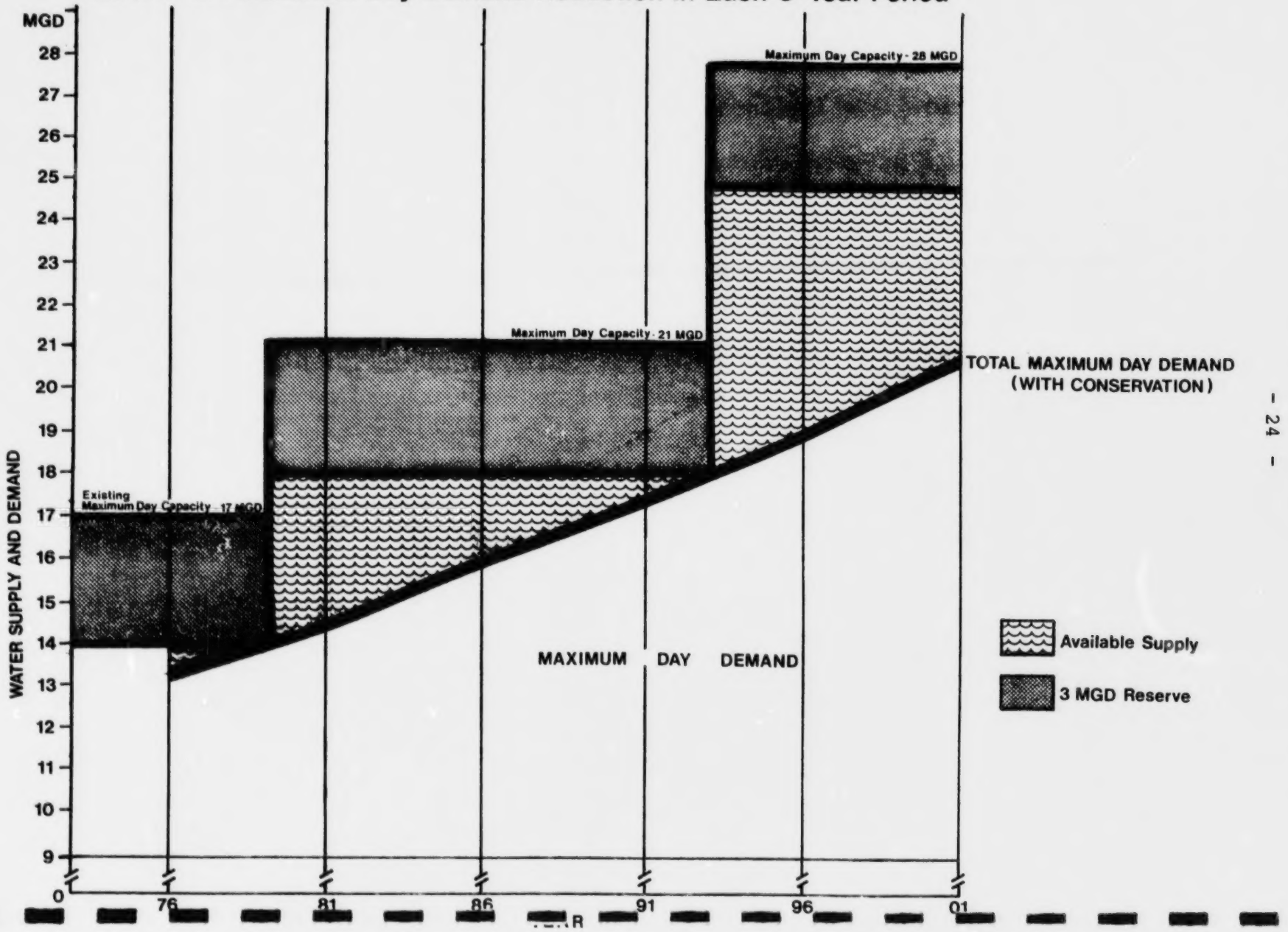
CAMBRIDGE

	1976	1981	1986	1991	1996	2001
Total	13.2	14.6	15.9	17.4	19.1	20.7
Average gallons per capita	122	117	113	110	106	104
peaking factor	1.53	1.50	1.50	1.49	1.50	1.49
maximum day demand	187	175	169	164	159	155

CAMBRIDGE WATER SUPPLY and MAXIMUM DAY DEMAND: 1976 - 2001

FIGURE 6

Effect of 3% Maximum Day Demand Reduction in Each 5-Year Period



(c) Implications in Cambridge during the next 10 years

There is a potential to build 5700 dwelling units which are either on registered plans or committed in draft approved plans. These units are needed to meet the estimated new housing demand to approximately 1981.

In terms of population these units can accommodate 17,100 people. Additional population will also be accommodated in the existing housing stock during the same period.

If the Cambridge water supply is not increased to 21 m.g.d. by 1981 then, like Kitchener-Waterloo in the same period, there will be a crisis to satisfy the consumption from people in already committed housing. As well, it is expected that the industrial and commercial consumption pattern will remain the same and its demands will also be affected.

In Cambridge there is no current practice by the City to cut back lawn watering during peak periods. As we approach the time when the maximum day demand cannot be satisfied, enforced restrictions will become a necessary alternative.

With the increase in maximum day supply to 21 m.g.d., this will satisfy the predicted 1988 demand including all of the existing commitments. Since it is necessary to plan for future supplies of housing, at this time, we can judge how much additional housing should be approved by Regional Council without exceeding the likely limited supply past 1988. Already, in addition to redevelopment and infilling in existing communities, are subdivision applications on record for 2400 dwelling units. This is enough housing to satisfy the expected new housing demand before 1988.

The same short-term crisis management applies to Cambridge as it does to Kitchener-Waterloo.

In the 1978-1982 Capital Expenditure Forecast for the Regional Municipality some of the required water supply items appear, as follows:

1978	Water Exploration Study
1979	Water Exploration Study
1980	Shades Mill Well No. 2
1981	-
1982	Willard Well

Regional Council approved this forecast with only the 1978 expenditure being actually committed in the Capital Budget. There is no budget or commitment for any item other than water exploration.

The only commitment that the future water supply will be brought on-stream when needed is through the approval by Regional Council of each item in its Capital Budget. Therefore the new wells needed in Cambridge starting in 1981 cannot be counted as committed until Regional Council approves the individual budget items.

Until development of at least one of the three new Cambridge wells, it is unreasonable to commit additional subdivision plans for registration for the next 10 years. The Regional Engineering Department could bring this supply on-stream in 1979 if Regional Council approves the Budget.

Regional Council has recently considered several subdivision plans located in Cambridge where a condition of draft approval is to not allow registration until the water supply is available. We should continue to approach approvals in this manner and possibly rank the subdivisions in order that they can be fairly released.

If it is possible, some developers may choose to freeze some of their existing housing commitments in Cambridge and use an equal amount as credits towards new registrations. This would involve entering into an agreement with the Regional Municipality. It may be possible, in isolated instances, to transfer water between pressure zones.

Next year, Regional Council should review the future water supply estimates and the estimated demand and announce the subdivision commitments which it can consider in that year allowing for a continuing oversupply of lots. The same requirement should apply to redevelopment proposals requiring development permission through rezoning or subdivision. This monitoring must be continued because of the sensitive demand-supply balance expected in the next 10 years. All community plans must contain this Regional policy on water supply. Regional Council makes the final decision on Regional supply of water.

The following areas are known to be affected by this approach:

Hespeler
Cambridge West Community
West side of Cambridge
South of Myers Road
Moffatt Creek Community
Franklin Park Estates, Phase II

OVERALL REGIONAL IMPLICATIONS

In the three cities, there is a reasonable assurance that the Region of Waterloo can meet the maximum day demand up to 1988. This of course depends upon obtaining water from the known future ground and river-connected sources.

If there is a reasonable effort to conserve water, then the period of reasonable assurance could likely be extended another five years to 1993.

It is the period after the three cities have reached the limit of known supply when there is no longer a reasonable assurance that maximum day demand can be satisfied. The alternatives are to go to the Grand River for water; go outside the Region and take water from aquifers or go to the Great Lakes.

The Region of Waterloo has 10 years to explore and secure the water supply needed to the end of this century. This is why some questions about the alternative considerations now become imperative and a lot of thought must be made by Regional Council and other agencies before the final tough decisions are made.

(a) The Issue of the Grand River and Up-Stream Storage

The Region will reach a point when the water demand in Kitchener-Waterloo is greater than the amount of water which is always available in the ground (i.e., the perennial yield). In order to not lower the ground water level, the Regional Engineering Department must bring water from the Grand River at certain times of the year and artifically recharge, or store, the water in the Mannheim Aquifer for withdrawal during the maximum demand period.

The Regional Engineering Department states that water should be taken out of the Grand River for both the induced infiltration and the artificial recharge projects. To date, there is no certainty of the amount needed but the estimate is for 115 c.f.s. during the ice-free season in 1990. Approximately 20 c.f.s. is needed for induced infiltration and 96 c.f.s. for artificial recharge. This estimate is based on having no strict regulations on the use of water. It is impossible to now take this amount of water out of the river without destroying the quality of water and flows. Taking water from the river requires technical improvements to maintain quality and flows.

The current thinking of the Regional Engineering Department is that the West Montrose Dam be constructed for up-stream storage of water as part of the Region of Waterloo's future water supply. This up-stream storage is necessary according to the Regional Engineering Department, to provide the required flows in the river for water supply while maintaining the capacity of the river to assimilate waste water loadings downstream at Kitchener and Cambridge. The proposal is to take water out of the river above the Kitchener sewage treatment plant and transport it to the artificial recharge pit. Up-stream storage is not required for induced infiltration initially. However, with storage these river-connected wells could be used year-round.

There is evidence from the Regional Engineering Department which indicates the purpose of the proposed West Montrose Dam in the water supply proposal and particularly the benefit to be derived. It is clear from other studies that the West Montrose Dam is not the only means of providing augmented river flows and maintaining river quality. The environmental reports produced by the Grand River Conservation Authority indicate the possibility of other up-stream storage facilities using smaller dams and reservoirs. The Region of Waterloo should not promote the West Montrose Dam for water supply until all of its various benefits and disbenefits and its alternatives have been fully explored.

(b) Maintaining River Quality

If water in considerable quantity is to be taken from the Grand River above the Kitchener sewage treatment plant, then it may be necessary to add costly additional treatment facilities to the Kitchener sewage treatment plant in order to better clean the water going into the river. This may be required for other reasons as well. The Ministry of the Environment now has a policy which requires that the quality of water in the river be maintained at a certain level and in order to achieve this, the Region of Waterloo must pay for further effluent treatment. Improved treatment is applicable to the Waterloo plant, which is up-stream from the water intake, and in Preston and Galt plants when they require expansion of their treatment capacities.

The need for up-stream storage is required to maintain river quality. The Ministry of the Environment is carefully examining the future flows in the Grand River with and without up-stream storage and deciding upon the minimum quality of water in the Grand River. It is fair to suggest that this minimum quality standard be carefully examined to assure the Region of Waterloo that it is not unreasonably high. The higher the standard, the more costly to achieve. Also, there is no information on whether up-stream storage is needed more for maintaining the current minimum required river quality or to maintain flows in the river. There is a cost associated with each of these objectives which must be balanced against each other.

There are other techniques which must be examined to improve water quality in the river without up-stream storage. This includes artificially inducing oxygen into the river below the Kitchener sewage treatment plant. Nevertheless, all of the agencies should look at the alternative cost-benefit equations, without considering the West Montrose Dam.

(c) Other Means of Increasing Supply

Another prospect for additional Kitchener-Waterloo supply is to examine the possibility of extending the existing watermain from St. Jacobs. There is a small quantity of water in the Elmira aquifer which could be made available to the City of Waterloo.

In the Cambridge area, the Region of Waterloo is now exploring for groundwater. A successful find will increase future water supply. Any new groundwater may be located outside the Regional Municipality. In this case, it will be necessary to satisfy the political and financial questions for bringing this water into the Region. If there is no agreement then it may be necessary to also consider artificial recharge in Cambridge. This raises the same questions of river quality, river flows and additional filtration in existing plants.

The Region of Waterloo should carefully explore the possibility of taking water from the Grand River downstream from the Kitchener sewage treatment plant. This is technically possible, but perhaps more expensive than taking the water up-stream from the plant. This alternative has the advantage of re-using the large volume

of treatment effluent which would normally be discharged into the river thereby requiring less up-stream storage. Coupled with this proposal is improved treatment at the plant. This alternative is of course not feasible if the Region of Waterloo resorts to taking water out of the river and pumping it directly into the water supply system unless expensive water purification is utilized.

Regional Council should decide whether the 3 m.g.d. should be established policy. By reducing this reserve it is possible to marginally increase the maximum day supply particularly in Cambridge.

The Region of Waterloo's course of action at this time is a deliberate attempt to generate water from within the Region rather than going to a Great Lake for water. The Great Lake alternative may be financially prohibitive but it must be compared with the cost of the West Montrose Dam, the additional treatment at the sewage plants and the artificial recharge system.

(d) Changing Water Demand through Conservation

Because the Region of Waterloo is exploring for new sources of water, there is no certainty about the future capability of the water supply for the three cities. This unknown raises questions about this community's ability to increase its demand for water, because of continuing the existing pattern of consumption and because of the expected growth and development in the three cities.

The Region of Waterloo has a reasonably good estimate of our future population in the three cities. The growth and development over the next 23 years in the three cities is expected to be much slower than in the past. The combination of a drop in the fertility rate and less immigration into the Region are the major causes of this slowdown. With the assumed turn-around in birth rates after 1981, there is still less growth than we predicted in 1975. The estimate of the average annual growth rate in population in the next 23 years will be about 2½%. If there is no turnaround in fertility in the early 1980's the projection will be lower and the water demand will be less than projected.

The Region of Waterloo has a good estimate of the future water consumption pattern in the three cities. If we continue the existing trend then, people and industry are expected to use just as much water per capita in the future as they typically used in the past five years.

The community has no sense of urgency or compulsion to conserve water and thereby spread out our water supply over more years. This consumption pattern is low compared to some of the urban communities on Lake Ontario and Lake Erie but we still have an option to conserve water. For example, the maximum daily water use per capita during 1977 in Kitchener-Waterloo is 162 gallons and in Cambridge it is 177 gallons. This compares with 250 gallons in South Peel; 263 gallons in Hamilton; 239 gallons in St. Catharines; 269 gallons in Niagara Falls; and 256 gallons in Welland. There is no apparent water shortage in these areas and no apparent need to exercise restraint and conservation, even though they should.

To achieve a reduction in the maximum daily consumption, a major reduction is needed in the use for lawn watering. It is estimated that 60% of the total water used on the maximum day in excess of the water used on the average day is consumed for lawn watering. This means that if people use at least half of the water now used for lawn watering, there could be a 13% decrease in the predicted maximum day water demand in Kitchener-Waterloo and a 9% decrease in Cambridge using the trend projection. Alternatively, prohibition of lawn watering to less than half of what we are using now during certain weeks of the year will considerably decrease the maximum day demand.

Conservation of water can buy a considerable amount of time if everyone is prepared to implement it. It can extend the amount of the known supplies to 1993 and allow the Region of Waterloo at least 10 years to carefully examine the long-term water supply sources without enduring the pressure of meeting current demand. The most beneficial method is to reduce lawn watering. An effective method of ensuring this, is to prohibit lawn watering in defined areas to certain days in the week and certain weeks during the peak consumption period. In effect, large areas will be designated as no lawn watering districts at certain times. This is easier to administer than the usual method of allowing certain sides of streets to water lawns on certain days in certain weeks which does not accomplish a major reduction in demand. Taxpayers should realize that a prohibitive on lawn watering at certain times is in their interest without being punative because of the saving of capital expenditure on expensive water supply facilities.

Other methods of conservation have been suggested as follows:

Ask for a voluntary cutback in consumption by households and industries;

Increase wholesale water rate;

Increase water rate to consumers to require "more you use, the more you pay";

All new toilets have volume reduction mechanisms and smaller tanks subject to the Ontario Plumbing Code;

All new faucets to be spring loaded subject to the Ontario Plumbing Code;

Smaller diameter in street lateral pipes as long as water pressures are maintained;

Water recycling by industry;

Senior levels of government eliminate sales taxes on water treatment and recycling equipment;

Reduced interest rates for purchases of water conservation equipment;

Reduce water pressure in mains if the Region has adequate supervisory controls to achieve this;

Reduce water consumption during peak periods;

Governments have a continuous public relations program;

Increase sewer surcharge rate;

Impose surcharge rate for peak periods;

Install cisterns or other rain water collection methods to store water for later use on lawns or for washing;

CRITICAL DECISION DATES FOR REGIONAL COUNCIL WITHOUT CONSERVATION

Project	Decision	Start Project	Water On-Stream
Twinning of Mannheim wells to correspond to development of induced infiltration.	1978	1979	1980
Induced infiltration of river-connected aquifer and development of Forwell, Woolner and Breslau wells.	1978	1979	1980
Conservation of Water Program	1978	1979	
Shades Mills, Willard, Hespeler wells	1978	1979	1981
Pilot Artifical Recharge Project	1978	1979	
Additional Cambridge wells outside City	1982	1983	1988
Artificial Recharge (Mannheim Pit)	1985	1986	1988

CRITICAL DECISION DATES WITH 3% REDUCTION IN MAXIMUM DAY DEMAND

Additional Cambridge wells outside City	1987	1988	1993
Artificial Recharge (Mannheim Pit)	1990	1991	1993